

ART. XVII. SCOLECODONTS FROM THE POTTER FARM
FORMATION OF THE DEVONIAN OF MICHIGAN

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(PLATES XXVIII-XXIX)

Through the kindness of Doctor G. Arthur Cooper of the U. S. National Museum, I have been enabled to study a series of Scolecodonts, fossil polychæte jaws, collected from the Devonian strata of Michigan. The specimens are all from the Potter Farm Formation, from the ledges by the side of the road, $\frac{1}{4}$ to $\frac{3}{8}$ miles south of Four Mile Dam, Alpena County. At present the Potter Farm Formation has not been correlated with formations in other areas. Dr. Cooper suggests, in a personal communication, that it is in about the position of the Moscow but it appears to be Tully in age, perhaps also correlating with the Upper Cedar Valley of Iowa.

The jaws, collected by Dr. Cooper, were taken from the matrix by an acid solution and many of them are in a very fine state of preservation. In comparing the series with other described fossil polychæta it is interesting to note their general similarity to the Silurian forms of Gotland. The few known forms from the Cedar Valley Formation of Iowa compare rather well, but that fauna as yet has not been thoroughly studied. All of the forms described in this paper, including all of the types, are in the United States National Museum of Washington, D. C., and a representative series of duplicate material has been retained for the collections of the Carnegie Museum.

DESCRIPTION OF SPECIES

Genus LUMBRICONEREITES, Ehlers, 1868

Lumbriconereites cooperi sp. nov.

Maxilla I, plate XXVIII, figs. 1-8.

The asymmetrical right and left jaws are elongate with from twelve to as many as nineteen sharp, flattened, backward pointing denticles which extend along the inner margin nearly to the posterior end. The average or usual number of denticles is fourteen. Measurements of

the specimens range in length from .77 mm. to 3.68 mm. Some fragmentary specimens indicate a probable size of over 4 mm. The denticles diminish in size from the anterior to the posterior. The fang or first denticle is large and is a continuation of the thickened portion of the outer margin. The second denticle is large but the third and usually the fourth are smaller, often minute. On the right jaw the thickened outer margin is notched posteriorly by a crescent-shaped bight while the outer thickened margin of the left jaw is rounded with but a slight suggestion of an indentation at about the mid-point. The muscle fossa extends nearly the full length of the outer side. The upper inner margins of the fossa of each jaw are thickened while the other margins of the fossa are thin and often broken away.

The larger part of the specimens in this collection are of this species. There are more right than left jaws. In the details the jaws are variable, but as a whole they correspond to each other. There does not seem to be any correlation between the size of the jaw and the number of denticles. The larger jaws often bear larger and less sharp denticles, while those of the smaller jaws are smaller, sharper and not so flattened. However, in some of the specimens this does not always hold true. At first the writer considered the left and right jaws as belonging to different species. When it was found that all jaws with the bight on the outer margin were right jaws, and that the outer margins of the left jaws corresponded to each other, the question arose as to whether they did not belong to the same species. Then too, when all other characters such as size, general shape, and number of denticles were found to be the same, the writer was convinced that the jaws should be of the same species.

There is a slight resemblance between Hinde's (1882) figures of *Lumbriconereites obliquus* Eichwald and *Cenoites major* Hinde and *Lumbriconereites cooperi* m. Stauffer (1933) described several species that have a general relationship to *Lumbriconereites cooperi* m. under the generic names *Lumbriconereites* and *Protarabellites*. From Stauffer's figures it would appear that *Lumbriconereites cameratus* Stauffer and *Lumbriconereites affinis* Stauffer are closely related to each other, if they are not the same species. They are right jaws and show the same general shape and arrangement of denticles and have an indentation on the outer margin similar to *Lumbriconereites cooperi* m. *Protarabellites fidelis* Stauffer, *Protarabellites delectus* Stauffer, *Protarabellites concavus* Stauffer and *Protarabellites productus* Stauffer, judging from the figures, resemble *Lumbriconereites cameratus* Stauffer and *Lumbriconereites affinis* Stauffer and are so slightly different

from each other that they might be considered as individual variations of the same species. All are similar to *Lumbriconereites cooperi* m., except that the right side of the outer margin (anterior side as oriented by Stauffer) is wider and the bight on the left side of the outer margin is not so pronounced. Foerste (1888) described a species, *Lumbriconereites austini*, which is similar to *Lumbriconereites cooperi* m., but the denticles are less pronounced and the bight on the outer margin, apparently, is much deeper. A jaw figured, but not described, by Searight (1923, plate I, figure 5) from the Cedar Valley Limestone of Iowa corresponds to *Lumbriconereites cooperi* m. in a general way.

Genus ARABELLITES, Hinde, 1879

Arabellites comis sp. nov.

Maxilla I, plate XXVIII, fig. 9.

The jaw is small, narrow, triangular in outline, with the posterior extremity obliquely truncate. Nine denticles, including the fang, are present extending along about two-thirds of the inner margin. The fang is long, thin, and gracefully curved in a slightly oblique direction from the plane of the jaw. The denticle following the fang is often minute and may be directed forward. The remaining denticles are sharp, triangular in shape, and diminish in size posteriorly. A large fossa is present at the posterior end and the upper margin is thickened into a round rim which extends posteriorly at the inner and outer margins in the form of short spurs.

This delicate species is represented by only two complete specimens and a number of fragments. The form does not much resemble any other species. If the anterior portion of *Arabellites anglicus* Hinde (1882) were longer, perhaps a slight similarity could be noted with the species under description.

Arabellites (?) *conus* sp. nov.

Maxilla I, IV or V (?), plate XXIX, fig. 7.

The jaw is narrow with one large, sharply pointed, conical denticle. The fossa is oval in shape and the upper margin is thickened into a rounded rim. The length of these forms is from .88 mm. to 1.17 mm.

It is difficult to determine to which of the maxillæ this jaw belongs. From its shape it could be either maxilla IV or V but according to

its size it should be maxilla I. Hinde (1882) described jaws very similar to these as the distal jaws of *Arabellites uncinatus* Hinde, but the latter were minute in size. Jaws of this kind, maxilla IV or V, are common in many species of recent forms, especially in the genus *Arabella*. If the relative proportions between maxilla I and V of most recent forms would be applied to *Arabellites conus* m. and the described maxilla V, then maxilla I would be about 12 mm. in length. So far no maxilla I of this size is known. However, in a few recent forms, *Lumbrinereis nasuta* Verrill, for example, the most distal maxillæ which are similar to *Arabellites conus* m. are quite large, nearly half the size of maxilla I.

Genus EUNICITES, Ehlers, 1868

Eunicites cornuformis sp. nov.

Maxilla I, plate XXVIII, fig. 10.

The jaw is oval in cross section, nearly straight in its posterior part, but curved obliquely in more than a ninety-degree angle at the anterior end which terminates with a sharp point.

This type of jaw or forceps is common among fossil and recent polychæta. *Eunicites simplex* Hinde (1879, 1882) is similar except that the curve of the forcep is more regular and not as great. Stauffer (1933) described two species, *Hyalinæcites subulatus* Stauffer and *Hyalinæcites plenus* Stauffer, that are comparable to *Eunicites cornuformis* m.

Eunicites angulatus sp. nov.

Maxilla I (forceps), plate XXVIII, fig. 13.

The jaw or forceps is massive in size and angular in cross section with a well defined fossa at the outer margin of the pointed posterior end. At the anterior end the jaw is flattened and turns obliquely downward. The surface of the jaw is uneven, and the outer margin at the posterior end is slightly grooved. The anterior end of the jaw is broken. The upper margin of the fossa is thickened into a wide, slightly rounded rim.

Among several recent genera this type of heavy, angular forceps is common but it has not previously been found in any fossil form.

Eunicites tanaodus sp. nov.

Maxilla IV (?), plate XXIX, figs. 5, 6.

The jaw is angular in outline with a very large conical denticle situated at the center of the outer margin. On each side of this denticle are two or three small denticles which irregularly decrease in size toward the ends. A large triangularly shaped fossa is present between the anterior and outer lateral margins.

Fossil polychæte jaws usually begin with a large denticle followed by smaller ones. A large denticle with smaller ones on each side is found more commonly among conodonts. These jaws, however, are not comparable to conodonts in any other way. As far as the writer knows, this type of jaw is not found in recent polychæta. As to the fossil forms, Stauffer (1933) described two species, *Ungulites bicuspidatus* Stauffer and *Ungulites tridentatus* Stauffer from the Ordovician of Minnesota, of this character.

Eunicites validus sp. nov.

Maxilla III (?), plate XXIX, fig. 4.

The jaw is thick and oval in outline. Ten large, conical, sharp pointed, backward curving denticles are present along the total length of the semicircular and well arched inner margin. The largest denticle is in the middle of the jaw and toward both ends the denticles decrease in size. A large oval fossa is present between the outer margins.

The only similarity of this species is, perhaps, with *Lumbriconereites arcuatus* Stauffer (1933).

Eunicites divergens sp. nov.

Maxilla III or IV, plate XXIX, figs. 8-11.

The jaws are large, irregularly oblong and rounded in outline, width greater than length, with a shallow concaveness on the lower side. A large fossa is present between the outer margins. In all examined specimens the outer margins were broken and incomplete. From two to six denticles are present on the inner margin. On the larger jaws the denticles are very large and blunt while in the smaller specimens they become correspondingly smaller and sharper. They are but slightly obliquely curved to the plane of the lower side. On the jaws, where several denticles are present, the larger ones are usually in the center and their size diminishes towards the ends.

In general these jaws resemble each other but there are wide individual differences. The jaws are so similar to *Eunicites mutabilis*

Eller (1934) of the upper Devonian of New York that the writer was tempted to place them in that species. Since *Eunicites divergens* m. is somewhat larger in size and greater in its width than length, it was thought best to make a new species for it. Maxillæ II and III of *Arbellites alfredensis* Eller (1934) also resemble those of *Eunicites divergens* m.

Genus *ÆNONITES*, Hinde, 1879

Ænonites orthodontus sp. nov.

Maxilla I, plate XXVIII, figs. 11, 12.

The jaw is long, sub-triangular in shape, and has straight margins that taper posteriorly to an acute angle. Including the fang, there are from ten to thirteen conical denticles, ranging from sharp to blunt, which diminish in size posteriorly. The usual number of denticles is thirteen, and they extend along about three-quarters of the inner margin. The large, sharply pointed, conical fang is nearly straight and points in a forward direction. The fossa is large and extends nearly the full length of the outer margin.

Three specimens of *Eunicites varians* (Grinnell) from the Cincinnati Group of Ontario and one specimen of *Ænonites amplus* Hinde from the Clinton of Ontario were described by Hinde (1879). Both of these species have characters that are similar to those of *Ænonites orthodontus* m. Hinde (1882) described several specimens from the Silurian of Gotland as *Ænonites naviformis* Hinde which, while not closely related, are of the same general character as *Ænonites orthodontus* m. Searight (1923) figured a number of specimens from the Cedar Valley Limestone of Iowa but he did not feel that it would be worthwhile to attempt generic and specific descriptions of these Devonian forms until more material had been obtained. One of his specimens (Searight, 1923, pl. I, fig. 1) is quite similar to *Ænonites orthodontus* m., except that the fang is shorter and curved backward. Stauffer (1933) described three species, *Ænonites inornatus* Stauffer, *Ænonites dignus* Stauffer, and *Ænonites tacitus* Stauffer that resemble each other very much and which are slightly similar to *Ænonites orthodontus* m.

Ænonites alpenænsis sp. nov.

Maxilla II (?), plate XXIX, figs. 1, 2.

The jaw is triangular in outline, measuring from .44 mm. to 1.68 mm. in length. The inner margin, bearing the denticles, is arched and,

with the thickened outer margin, forms a shallow concave area. The number of denticles varies between eleven and eighteen but the usual number is thirteen. The fang, or first denticle, is usually long, pointed, and nearly straight; the second is very large, wide, and blunt and is followed by several more large denticles, often seven or eight, which diminish in size posteriorly. The last denticles are usually minute. Some of the denticles appear to be badly worn. Part of the outer margin has a round thickened rim and it makes about a right angled turn to form an anterior margin. The rest of the outer margin is very thin and is usually broken away. This wide angle on the outer margin helps to form a large, wide, triangular-shaped fossa.

These very powerfully constructed jaws are probably maxilla II, but the writer cannot associate them with any of the maxillæ I described in this paper. The jaws show individual variation, and perhaps some authorities would consider that there were several species represented. This form resembles *Ænonites radula* Hinde (1882) from the Silurian of Gotland very much. Both species have the same triangular shape, a slightly concave upper surface, and a deep hollow opening (fossa) on the upper surface of the outer side. The denticles are about the same in number but differ in form. *Ænonites alpenænsis* m. averages 1.20 mm. in length, while *Ænonites radula* Hinde averages .81 mm.

Ænonites abnormis sp. nov.

Maxilla II (?), plate XXIX, fig. 3.

This form is very much like the triangular shaped *Ænonites alpenænsis* m. but differs in having, besides the thirteen regular denticles, a large pointed flange or tooth on the outer margin near the fang. The fossa is rather shallow, but wide. The specimen measures 1.20 mm. in length. The writer hesitates in erecting a new species for this form, but the interesting structure on the outer margin seems to warrant some recognition. Hinde (1882) described a variety, *Ænonites radula cristula* Hinde, which possesses a flange, but from the figure it is not possible to make comparisons with *Ænonites abnormis* m.

DIOPATRAITES gen. nov.

Mandible, plate XXIX, figs. 12-15.

The mandible is large and consists of a three-toothed frontal plate followed by a tapering shaft. Fine striæ are present which are parallel

to the outer and posterior margins of the plate. The inner margin of the plate is straight, and is the point of contact with the opposite mandible. The upper surface of the shaft is convex while the lower or inner side is angular and slightly concave.

Mandibles of *Diopatraites* are similar to those of certain recent *Diopatra*, especially to the mandibles of Ehler's (1887) *Diopatra pourtalesii* and *Diopatra glutinatrix*. However, Treadwell (1921) considers that these species belong to *Onuphis*.

***Diopatraites conformis* sp. nov.**

The length of the mandible is from 2.85 mm. to 4.68 mm. with the frontal plate usually just a little smaller than the shaft. The frontal plate is large and angular in outline, with three very large conical denticles at the anterior end. The plate is set at about a forty-five degree angle with the shaft. The denticles are irregular in size and shape, and vary in the direction in which they point. The upper surface is comparatively flat, and on most specimens fine striæ are discernible on the posterior half of the frontal plate, the striæ extend parallel to the outer margin and then curve to conform with the posterior margin. The inner margin of the frontal plate is straight. The upper surface of the shaft is convex in form while the under surface is angular and slightly concave. In some specimens the shaft is slightly turned or twisted, and in that case the concave area is on the inner side. The shaft tapers to a pointed posterior extremity. No line of demarcation is evident between the shaft and plate on the under side of the mandible.

Mandibles seem to be very rare in collections of fossil polychæta. Stauffer (1933) described two species and Searight (1923) figured one but did not describe it. Hinde (1882) found it a curious circumstance that out of the hundreds of examples of jaws from the Silurian of Gotland that he observed, not a single mandible was detected. Nor did he, except for a questionable plate, find any true mandibles among the English and Canadian forms (1879, 1880). Dr. Hinde believed that if the lower plates of fossil polychæta were like the lower plates of recent forms, that is, more calcareous than the chitinous upper jaws, then there should be a better chance of their being preserved. This he felt was true in the Solenhofen forms described by Ehlers (1869) in which the lower plates are preserved and only impressions of the upper jaws are present. The writer believes that the chitinous jaws would have more chance of resisting destruction by waters circulating in the ground than calcareous forms but the latter are stronger and less breakable. There are a number of well preserved

mandibles of *Diopatraites conformis* m., and they seem to be of the same chitinous material as the maxillæ. The mandibles conform well with the maxillæ I described in the paper, being about twice their size. This is about the same proportion as found between mandibles and maxillæ I in most of the recent forms.

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EXPLANATION OF PLATE XXVIII

Figures magnified about 18 times

All specimens figured here are in the U. S. National Museum

- FIGS. 1-3. *Lumbriconereites cooperi* sp. nov. Maxilla I, left jaw.
Fig. 1. Side view.
Fig. 2. Under side, outer margin.
Fig. 3. Upper side.
- FIG. 4. *Lumbriconereites cooperi* sp. nov. Maxilla I, left jaw, under side.
- FIGS. 5, 6. *Lumbriconereites cooperi* sp. nov. Maxilla I, right jaw.
Fig. 5. Under side.
Fig. 6. Side view, outer margin.
- FIGS. 7, 8. *Lumbriconereites cooperi* sp. nov. Maxilla I, right jaw.
Fig. 7. Under side.
Fig. 8. Side view.
- FIG. 9. *Arabellites comis* sp. nov. Maxilla I, right jaw, upper side.
- FIG. 10. *Eunicites cornuformis* sp. nov. Maxilla I, forceps.
- FIGS. 11, 12. *Enonites orthodontes* sp. nov. Maxilla I, left jaw.
Fig. 11. Upper side.
Fig. 12. Under side.
- FIG. 13. *Eunicites angulatus* sp. nov. Maxilla I, forceps.



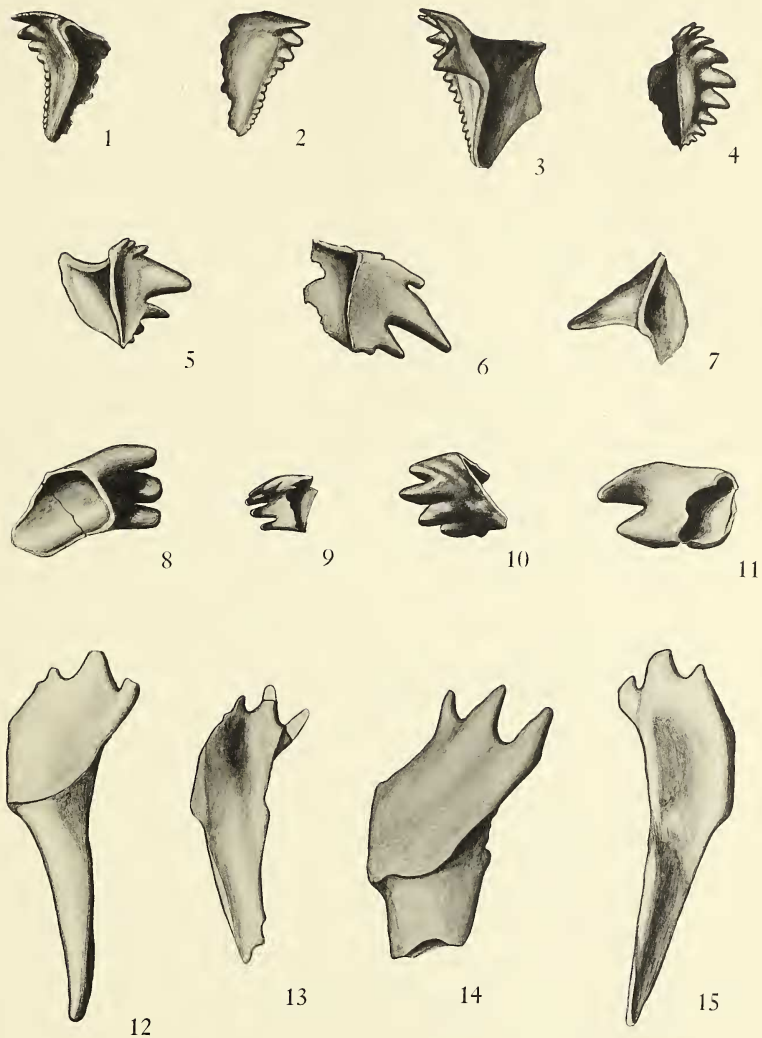
Scolecodonts from Devonian of Michigan.

EXPLANATION OF PLATE XXIX

Figures magnified about 18 times

All specimens figured here are in the U. S. National Museum

- FIGS. 1, 2. *Enonites alpenænsis* sp. nov. Maxilla I or II, right jaw.
Fig. 1. Upper side, outer margin.
Fig. 2. Under side.
- FIG. 3. *Enonites abnormis* sp. nov. Maxilla I or II, right jaw, upper side, outer margin.
- FIG. 4. *Eunicites validus* sp. nov. Maxilla III (?), left jaw.
- FIGS. 5, 6. *Eunicites tanaodus* sp. nov. Maxilla IV (?), left jaws.
- FIG. 7. *Arabellites (?) conus* sp. nov. Maxilla I, IV or V (?), right jaw.
- FIGS. 8-11. *Eunicites divergens* sp. nov. Maxilla IV, right and left jaws.
- FIGS. 12, 15. *Diopatraites conformis* sp. nov. Right mandible.
Fig. 12. Upper side.
Fig. 15. Under side.
- FIG. 13. *Diopatraites conformis* sp. nov. Left mandible, under side.
- FIG. 14. *Diopatraites conformis* sp. nov. Right mandible, upper side.



Scolecodonts from Devonian of Michigan.